

## CORRESPONDENCE

## Comments on "Economic Aspects of Hurricanes"

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The recent paper by Sugg [1] is noteworthy in its approach to evaluating hurricane damages and costs, and discussing the status of warnings. I would like to amplify what he has written, by saying a few words about floods from hurricane rainfall.

Hurricane damage can come from wind, from high tides, and from storm runoff. In analysis of hurricane damage it is pertinent to recognize these three major sources of damage because they differ with respect to the nature of the damage, the protective measures, and the techniques and problems of forecasting.

As Mr. Sugg has pointed out, much of the damage from hurricane Betsy in 1965 was from high water. With Hazel in 1954 wind damage seemed to predominate. Most of the damage from Diane in 1955 was from flood runoff.

The case of Diane illustrates three important points. First is the difficulty of getting estimates of damage. Some sources give the flood damage alone as greater than the \$800 million given by Mr. Sugg as the total for the entire storm. Incidentally, in discussing flood damages, it is customary to recognize the changing value of the dollar from year to year. The second point related to Diane is the fact that it followed Connie so closely. This fact led to much greater flooding than if the phenomenal rain from Diane had fallen on dry ground. The third point is the establishment of River Forecast Centers at Hartford, Conn., and at Augusta, Ga. as a direct result of the Diane floods.

The River Forecast Centers at Hartford and Augusta are among 11 which now cover the most flood-prone areas of the United States. At these centers the weather is watched continually, and account is kept of soil moisture and other pertinent hydrologic conditions. Typically, flood forecasts are made by objective computerized methods which usually tell the expected river heights within a foot, often days in advance. This forecast interval allows people to evacuate flood plains, move or protect damageable property, and mobilize for disaster relief.

## REFERENCE

1. A. L. Sugg, "Economic Aspects of Hurricanes," *Monthly Weather Review*, vol. 95, No. 3, Mar. 1967, pp. 143-146.

[Received April 7, 1967]

## Reply

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I certainly agree with Mr. Wilson that the River Forecast Centers contribute greatly to the hurricane warning service and play a considerable role in our efforts to reduce death and destruction. Their service is recognized by the National Hurricane Center and clearly reflected in operational manuals of the Weather Bureau. But floods caused by tropical cyclones must certainly represent a very small portion of the River Forecast Center's total effort and it is probably for this reason that the service was not headlined in any sort of way in my paper [1].

There is a great need for papers and information about the economic aspects of all types of severe weather. This is a very interesting field for research and I'm sure that professional meteorologists, and others for that matter, would like to see similar studies on floods, tornadoes, cold waves, etc.

I want to take this opportunity to make the following correction of an error in my paper [1]: On page 143, table 1, the date after hurricane Cleo should be 1964 instead of 1960.

## REFERENCE

1. A. L. Sugg, "Economic Aspects of Hurricanes," *Monthly Weather Review*, vol. 95, No. 3, Mar. 1967, pp. 143-146.

[Received May 4, 1967]